PHENIX

mRPC HV & LV OPS in the mRPC TEST LAB

PHENIX Procedure No. PP-2.5.2.20-02

Revision: A **Date: 5/17/2013**

Hand Processed Changes

HPC No.	Date	Page Nos.	Initials

- *Typo: On the Revision Control Sheet, the "Approved By" column is blank. It should have 4 names on it, since this procedure was signed by 4 people.*

Approvals

5/29/13
PHENIX S E & I — Date
DON LYNCH

5/29/13
Cognizant Scientist/Engineer — Date
MICKEY CHIU/Activity Manager

5-30-13
PAUL GIANNOTTI
PHENIX QA/Safety — Date

5/30/13
YOUSEF MAKDISI
ESRC Liaison — Date

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PHENIX QA/Safety	Date	ESRC Liaison	Date

REVISION CONTROL SHEET

LETTER	DESCRIPTION	DATE	AUTHOR	APPROVED BY	CURRENT OVERSIGHT
A	First Issue (Based on RPC Factory similar procedure PP-2.5.2.15-02	5/17/2013	Mickey Chiu		P. Giannotti

1.0 Purpose

The purpose of this document is to define operating procedures for the prototype multigap Resistive Plate Chamber (mRPC) detector tests including the operation of the high voltage (H.V) and low voltage (L.V) in the mRPC test lab in Bldg. 912. These procedures will ensure:

1.1 the safety of all personnel from risks associated with the operation of the H.V and L.V systems which are required for the operation of incoming mRPC assembled detectors and the front end electronics boards (FEEs),
1.2 the implementation of the appropriate emergency procedures,
1.3 prompt notification of the appropriate CA-D and ES&H specialists,
1.4 the maintenance of appropriate CA-D emergency status,
1.5 the preservation and protection of the environment, and
1.6 the protection of BNL facilities and equipment.

2.0 Responsibilities

The first level of responsibility rests with the personnel who perform the mRPC detector tests in the mRPC test lab. All personnel are required to obey the “two man rule”.

Before and during detector tests, the responsibilities of mRPC personnel are:

2.1 read all safety and work planning documents, including this document, that are posted at the mRPC test lab and be aware of all possible hazards,
2.2 monitor the status for the H.V systems and L.V systems according to a prescribed check off list, given in Appendix A and posted in front of an electronics rack, at least once during a given test,
2.3 in the event of an alarm or irregularity, first follow the safety procedures and then contact an expert from the expert list given in Appendix B and posted in front of the electronics rack.

The second level of responsibility rests with the mRPC experts. It is the responsibility of the mRPC experts to:

2.4 maintain safe testing condition. This includes:

2.4.1 setting, adjusting, and checking the H.V and L.V power supplies,
2.4.2 posting special instructions and notifications as required, and
2.4.3 responding to irregular operation conditions and emergencies, as described in the procedures section of this document.

3.0 H.V and L.V system specifications

3.1 H.V system

The mRPC H.V main frame is a CAEN SY 4527 main frame and the H.V board used in the main frame is a CAEN A 1526.

3.1.1 CAEN SY 4527

- Power Requirements: voltage range 100/230 V, frequency 50/60 Hz, Power 3400 W
- Max. number of H.V boards per main frame: 8 with A 1526
- Max. output power: 2250 W (present setup: 750 W)
- Communications via RS 232 and TCP/IP
- Programmable handling of parameters and errors (possible to set and monitor channel parameters, advanced trip handling)
- Hardware current protection

3.1.2 CAEN A 1526

- 6 H.V channels/board
- Individual channel controllable
- CPE 23.100.151-046 type male connector to be mated with CPE 23.100.052-045 type
- Specification for each channel is following:
- Negative Polarity (Yellow LED light on as the relevant channel is on)
- Output voltage: 0-15 kV
- Max. output I: low range 100 μ A; high range 1 mA
- Voltage set/monitor resolution: 1 V
- Current set/monitor resolution: 10 nA; 100 nA
- Ramp Down (per sec): 1-500 V; 1 V step
- Ramp Up (per sec): 1-500 V; 1 V step

3.2 L.V system

The mRPC L.V system Agilent E3633A LV power supplies.

- 2 L.V channels each
- Max. output voltage: 20 V
- Max. output current : 10 A

4.0 Precautions

4.1 H.V system precautions

The maximum output current limit for each channel is set to be 100 μ A in hardware. All open high voltage cables and connections are enclosed within grounded detector frames, the mRPC Test Stand enclosure or within the grounded enclosure of power supplies and electronic modules in order to eliminate the possibility of personnel getting in contact with high voltage. When the back door of electronics rack is closed and latched all H.V points are inaccessible to personnel. During mRPC detector tests with H.V on, a H.V warning sign will be posted in the mRPC test area to alert personnel to the H.V status.

4.2 L.V system precautions

The mRPC uses high current low voltage power supplies to provide the power required for the HBD front end electronics boards (~ 5 V, up to 13 A, ~ 30 W per ADC FEE board). This power is distributed from the L.V power supply to the detectors and on the detectors fanned out to the FEE. Since the voltage is low, the L.V circuits may stay energized in the presence of personnel carrying out work related to the detector tests. However, if work is to be performed on the FEEs the low voltage will be turned off first. At other times waveform digitizer modules are used which do not require use of the Agilent low voltage supplies, and the Agilent supplies should be turned off when not in use.

5.0 Standard Operating Procedures

5.1 Turning on H.V to the mRPC

Prior to turning on H.V. verify that the gas system is on and operating in accordance with PHENIX Procedure No. PP-2.5.2.20-1

5.1.1 Run through the check off list in Appendix A: steps 1.1 – 1.7.
5.1.2 Place the "H.V ON" sign in a prominent position.
5.1.3 Turn the power-on key to the right position (LOCAL).
5.1.4 Check that the appropriate current limits (max. 20 μ A) and H.V limits (max. 11000 V) in software are in place for the each H.V channel. The mRPC experts and personnel assigned to operate the mRPC H.V shall maintain a H.V logbook where the operating parameters of the H.V setting are recorded.
5.1.5 Check that the ramp up rate for each channel is appropriate (max. 100 V/sec).
5.1.6 Starting ramping up H.V

Procedure for ramp up:

- ✓ Monitor output current value and wait to stabilize mRPC prototype (< 30 min) between steps
- ✓ Each 1000 V/step (0-8000 V)
- ✓ Each 100 V/step (8000-11000 V)

5.1.7 If any of the H.V channels trips, disable all channels until the reason for the trip is understood and call mRPC experts listed in Appendix B and posted in front of an electronics rack. If the reasons for the trip are understood, then begin the procedure again from 5.1.1.

5.1.8 When ramping is complete for the mRPC detector test, the mRPC experts and personnel assigned to operate the mRPC H.V shall record the H.V status in the H.V logbook.

5.1.9 H.V is ready for the mRPC test.

5.2 Turning off H.V to the mRPC

5.2.1 Begin ramping down the H.V (max. 200 V/sec).

5.2.2 Verify by the read back that the H.V is off in each channel.

5.2.3 Turn the power-on key to the middle position (OFF).

5.2.4 Remove the “H.V ON” sign.

5.2.5 Switch off the main power on the back panel of H.V power supply if there won’t be a scheduled test within 2 hours.

Appendix A: H.V check off list

1.1 Verify with personnel assigned to prepare the mRPC detector for the test or who have assembled an mRPC detector that the mRPC prototype is ready for testing.
1.2 Make sure that the mRPC detector and all high voltage connections from the gap are safely enclosed within the detector frame or the mRPC Test Stand enclosure.
1.3 Check that the gap high voltage input is connected to the CPE high voltage cable.
1.4 Check that the other end of the CPE cable is connected to the H.V power supply properly. If you find an improper connection, you must first correct it. Any unmated connections with the mRPC detector must be removed. It is strictly forbidden to turn on the H.V main frame with an open CPE cable in the setup.
1.5 Check that the cooling fan at the top of the electronics racks, where H.V/L.V supply is located, is running. If the cooling fan is not running, contact Frank Toldo (x7788, fatoldo@bnl.gov) to fix it.
1.6 Switch on the main power on the back panel of H.V power supply.
1.7 Close and latch the back door of electronics rack.

The test lab personnel must carry out the following list of checks at the beginning of any period of work in the test lab after an absence. For example, the personnel should do these checks once in the morning upon arrival, and once again after returning from lunch.

- ✓ All cooling fans at electronics racks are operating
- ✓ Voltages and currents at all L.V and H.V channels are correctly set.
- ✓ Temperature of H.V channels

Appendix B: List of mRPC experts

The current list of mRPC Experts can be found on the PHENIX Internal Web site at:

http://www.phenix.bnl.gov/WWW/publish/chiu/fotof/912/safety/index.html